UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/753,433	01/02/2001	John David Westwood	SJO990037US1	3544

7590 07/16/2003

Ron Feece
INTERNATIONAL BUSINESS MACHINES CORPORATION
Dept. L2PA
5600 Cottle Road
San Jose, CA 95193

EXAMINER
MCDONALD, RODNEY GLENN

ART UNIT	PAPER NUMBER
1753	9

DATE MAILED: 07/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/753,433	WESTWOOD, JOHN DAVID	
	Examiner	Art Unit	
	Rodney G. McDonald	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the corr spondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 May 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) *1-18* is/are withdrawn from consideration.

5)☒ Claim(s) *32-40* is/are allowed.

6)☒ Claim(s) *19-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Election/Restrictions

Claims 1-18 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 4.

Claim Objections

Claims 19 and 24 are objected to because of the following informalities:

In claim 19, line 12, it is suggested to inset a "-" between "in" and "plane".

In Claim 24, line 2, it is suggested to write "wt." as "weight".

Correction is required.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 19-29 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-44 of U.S. Patent No.

6,425,989 in view of Hiramoto (U.S. Pat. 6,110,609), Katsuragawa et al. (U.S. Pat. 5,112,701) and Sano et al. (U.S. Pat. 5,503,943).

A method of making at least one of a ferromagnetic first shield layer, a ferromagnetic second shield layer, a ferromagnetic first pole piece layer and a ferromagnetic second pole piece layer of a read write magnetic head that has an air bearing surface (ABS) with a magnetron sputtering system wherein the magnetron sputtering system includes a sputtering chamber, a wafer substrate in the chamber where the layers are to be formed, a magnetron cathode assembly including a target in the chamber of a selected material to be sputtered and a magnetron array mounted behind the target such that the target is located between the magnetron array and the substrate, a first power supply for applying power with an RF component to the magnetron, a second power supply for applying an RF substrate bias to the wafer substrate, a process gases supply and a gas and pressure control means for controlling flows and mixtures of selected process gases to the chamber under a selected pressure, the method comprising the steps of: employing the second power supply to apply an RF bias to the wafer substrate from 0 to -15 volts; employing the process gases supply and the gas and pressure control means to supply selected gases to the chamber with a pressure from 4.0.times.10.sup.-3 to 8.0.times.10.sup.-3 mbar with at least one of the selected gases being nitrogen (N.sub.2); providing a selected material for the target that is iron (Fe) based; sputter depositing the selected material to form on said wafer substrate at least one of said layers comprising an iron nitride (Fe--N) based material with said at least one of the layers having an easy axis and a hard axis; and

hard axis annealing the at least one of the layers with a magnetic field applied parallel to the hard axis of said at least one of the layers. (Column 15 lines 13-47)

The method includes sputter depositing multiple films of selected materials onto the substrate to form at least said one layer into a laminated layer of alternating iron nitride (Fe--N) based and alumina films. (Column 15 lines 58-61)

The ferromagnetic layers are formed with a magnetic anisotropy of at least 2.0 Oe. (Column 15 lines48-50)

The preselected annealing is in a temperature range of 180 to 260 degrees C. (Column 16 lines 62-64)

The differences between Westwood and the present claims is that utilizing DC instead of RF is not discussed, utilizing Ni and Co in the Fe based film is not discussed, the gas range limitations are not discussed, and utilizing nitrous oxide is not discussed.

Hiramoto et al. teach a magnetic thin film in which the crystal orientations are oriented in a predetermined direction, the axis of hard magnetization of each magnetic crystal grain caused by the crystal magnetic anisotropy has an orientation. (Column 4 lines 45-48) In Fig. 2 a head including magnetic thin films 16 and insulating layers 17 are laminated so as to form a multi-layered member. (Column 7 lines 58-62)

The magnetic thin film of the present invention can be realized by any techniques that have been conventionally used, such as an electrodeposition technique, a super-rapid cooling method and ***a vapor deposition method***. However, when a desired thickness of a film is in the range from several ***tens of nanometers to several micrometers (Compare to Applicant's required thicknesses)***, ***it is preferable to***

produce the film by a vapor deposition method in a low pressure atmosphere. As for the vapor deposition method, sputtering methods such as high frequency magnetron sputtering (RF sputtering method), direct current magnetron sputtering (DC sputtering, opposed-target sputtering, and ion beam sputtering are preferable. Especially, ***the use of DC magnetron sputtering makes it easy to obtain a material exhibiting excellent soft magnetic characteristics immediately after formation of a film even if the substrate temperature is room temperature or less. (Column 8 lines 29-44)***

In order ***to form the magnetic thin film*** of the present invention ***by sputtering***, first, a composition of the magnetic thin film is determined in view of the saturation magnetic flux density, the soft magnetic characteristics, the value of resistance of a magnetic material, the corrosion resistance or the like. Then, ***the composition of a sputtering target is determined (Compare to target composition of Applicant's claims. Composition is taught to be selected)*** in view of a discrepancy in the composition. ***Then, a magnetic thin film is formed by sputtering an alloy target on a substrate in an inert gas.*** Alternatively, a magnetic thin film is formed by simultaneously sputtering a metal target and additional element pellets that are arranged on the metal target. ***Alternatively, a magnetic thin film is formed by introducing a part of an additional substance in a gas state into an apparatus and performing reactive sputtering.*** When the discharge gas pressure, the discharge power, the temperature of the substrate, ***the bias state of the substrate,*** the magnetic field value above the target or in the vicinity of the substrate, the shape of the target or the direction in which the particles are incident to ***the substrate is changed***, not only

the structure of the magnetic thin film of the present invention, but also the apparent coefficient of thermal expansion, ***the magnetic characteristics of the film or the like can be controlled (Compare to controlling the bias to be zero). (Column 8 lines 45-68)***

Furthermore, when it is necessary further to raise the magnetic anisotropy of the magnetic thin film of the present invention, a heat treatment in the magnetic field or formation of a film in the magnetic field ***can be preformed*** as well. (Column 9 lines 5-9)

Magnetic films can be formed with an alloy target with ***a gas pressure of 1 to 4 mTorr (Compare to Applicant's pressures)***, ***a nitrogen flow rate of 2%-4% (Compare to Applicant's required nitrogen amount), an oxygen flow rate of 0%-2%*** and a main sputtering gas of argon. (Column 9 lines 49-68; Column 10 lines 1-6)

Multi-layers structures can exist as magnetic layer/underlying layer/Al_2O_3 layer/magnetic layer/underlying layer/Al_2O_3 layer/substrate. (Column 17 lines 36-44)

The motivation for utilizing DC magnetron and controlling gas range limitations is that it allows for obtaining a material exhibiting excellent soft magnetic characteristics immediately after formation of a film. (Column 8 lines 29-44)

Katsuragawa teach a thin magnetic film comprising as a main ingredient , nitrides of metal (Fe, Co, and Ni) (See abstract)

Katsuragawa teach a C-axis oriented thin magnetic film comprising as the main ingredient nitrides of at least one metal selected from Fe, Co and Ni. (Column 3 lines 8-

10) It is preferred to make nitrogen into plasma and to collide against a target comprising metal atoms of at least one selected from Fe, Co, Ni, alloys thereof, nitrides and/or fluorides thereof. (Column 3 lines 65-68) It is also preferred to use argon made into plasma together with nitrogen in the form of plasma. (Column 4 lines 2-4) Magnetic films of nitride-oxide mixture can be formed by irradiating ionized oxygen-containing nitrogen gases (argon is preferably added) to a target material. (Column 8 lines 21-25)

The motivation for utilizing magnetic films of NiFeCo-ON or NiFeCoN is that it allows production of films with a perpendicular magnetic anisotropy of not less than 4 KOe. (Column 3 lines 14-16)

Sano et al. teach forming magnetic films during vapor deposition utilizing as an oxidizable gas oxygen, nitrous oxide, ozone, or a gas mixture containing an inert gas such as argon, nitrogen, etc. mixed therewith can be used, desirably a gas mixture of oxygen with argon or nitrogen. (Column 3 lines 43-48)

The motivation for utilizing nitrous oxide is that it is an oxidizes the depositing film. (Column 3 lines 43-48)

As to the amount of nitrous oxide it is believed that since Hiramoto et al. teach the required amount of nitrogen and oxygen to be utilized that the amount of nitrous oxide could be determined based on the required amounts of nitrogen and oxygen taught by Hiramoto et al. (See Hiramoto et al. discussed above)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified U.S. Pat. 6,245,989 by utilizing a controlled gas composition and DC sputtering as taught by Hiramoto et al., to have

utilized Co and Ni in the film as taught by Katsuragawa and to have utilized nitrous oxide as taught by Hiramoto et al. because it allows for obtaining a material exhibiting excellent soft magnetic characteristics immediately after formation of a film, it allows for production of films with a perpendicular magnetic anisotropy of not less than 4 KOe and it allows for depositing an oxidized film.

Allowable Subject Matter

Claims 32-40 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

Claims 32-40 are indicated as being allowable because the references do not teach the subject matter including sputter depositing a seed layer of NiFeCo-O-N with a second process gas that has a higher N_2O content than the first process gas.

Response to Arguments

Applicant's arguments filed 5-20-03 have been fully considered.

In response to the argument that the references do not suggest hard axis annealing, it is agreed that the previously applied references in the last office action did not suggest hard axis annealing. However, U.S. Pat. 6,425,989 now cited suggests hard axis annealing. U.S. Pat. 6,425,989 is applicable in an obviousness type double patenting rejection. A 35 U.S.C. 102(e) rejection is not applicable because U.S. Pat. 6,425,989 has the identical inventor as the instant application and therefore is not an invention by another. A terminal disclaimer would over come the obviousness type

double patenting rejection. Canceling non-elected claims 1-18 would further expedite prosecution.

This action is made NON-FINAL.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 703-308-3807. The examiner can normally be reached on M- Th with Every other Friday off..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 703-308-3322. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9310 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Rodney G. McDonald
Primary Examiner
Art Unit 1753

RM
July 9, 2003